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WASHINGTON STATE UNIVERSITY
KING COUNTY

http://www.metrokc.gov/wsu-ce

919 SW Grady Way, Suite 120
Renton, WA 98055-2980
(206) 205-3100, 711(TTY)

Diversity on the Farm

Agriculture and Natural Resources Fact Sheet #530

The whole is greater than the sum of the parts.

Why Diversify?

One aspect of sustainable agriculture involves designing farm systems using nature as a model. In most natural ecosystems, the greater the diversity the more resistant an ecosystem is to change and the better able it is to recover from disturbance. In agricultural ecosystems, or *agroecosystems*, disturbance is much more frequent, regular, and intense. However, high ecological diversity means a greater potential for beneficial interactions. Although it may be difficult to maintain diversity in such systems, they need not be as diversity-poor as most conventional farm systems typically are. Introducing and managing diversity on the farm provides both ecological and economical benefits, some of which are outlined here. The diagram on the next page illustrates the process of managing diversity in an agroecosystem.

Benefits

- Serves to buffer against disturbance.
- Increases stability of a system.
- Allows greater efficiency in resource use. Different crops occupy different niches and make different demands on soil nutrients. Managing the complexity of a diverse farm system can reduce need for external inputs.
- Can contribute to diversity in the surrounding natural ecosystems.
- Can postively impact nutrient cycling, regulation of hydrological cycle, and detoxification of noxious chemicals.
- Reduces financial risk. If one crop does poorly, income from another can compensate.

Types of Diversity

We most often think of diversity as the presence of many species in a system, however, diversity means more than this. Ecological diversity varies in space, time, composition, and function. Spatial diversity refers to the location of components in an agroecosystem both *vertical,* as in the number of horizontal levels of a farm (e.g., trees, shrubs, grass, soil) and *horizontal (i.e., spatial patterns of plants and other organisms).* Temporal diversity (time) refers to cyclical changes (daily, monthly, seasonal, etc.). Diversity in the compostion of a system includes numbers of species and genetic diversity, as well as structural diversity or the numbers of ecological niches present in a system. The interactions among species, energy flow patterns, and material cycling are considered functional dimensions of diversity.

Diversity Practices

Agroforestry—Optimizing the benefits from the biological interactions created when trees and/or shrubs are deliberately combined with crops and/or animals. Promotes many forms of diversity in the agroecosystem, creates habitat for wildlife and beneficial organisms, offers a greater diversity of products, and can lower the need for external inputs.

Cover cropping—Planting noncrop species to provide soil cover between cropping cycles. Adds temporal diversity. Planting different types adds species diversity. Also enhances soil biological activity and increases diversity of soil organisms. Provides habitat for wildlife and beneficial organisms.

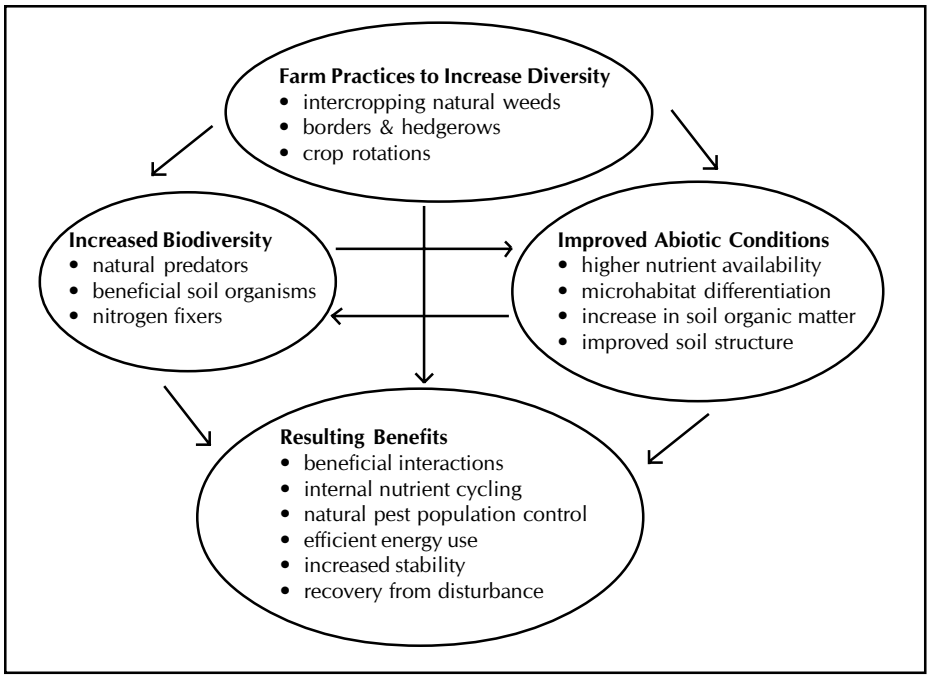
Hedgerows and buffers—Besides offering such benefits as marking boundaries, wind protection, habitat enhancement, and animal exclusion, hedgerows and buffers increase the diversity of a farm beyond crop species to include noncrop species. They also serve to attract and provide habitat for beneficial organisms.

High organic matter inputs—Applying compost, cover cropping, incorporating plant residues into soil surface, and other means of increasing soil organic matter content. Stimulates belowground diversity.

Intercropping—Growing two or more crops together in combinations that foster positive interactions. Adds temporal diversity through sequential planting of different crops over a season. Also adds horizontal, vertical, structural, and functional diversity.

Reduced chemical inputs— Reducing the use of herbicides and other pesticides. Such chemical inputs often reduce nontarget populations or limit the abundance and diversity of many other organisms.

Reduced or minimum tillage—Reducing the intensity of soil cultivation and leaving plant residues on the soil surface. Increases diversity of soil organisms by decreasing disturbance.



Dynamics of managing a diverse agroecosystem (adapted from Gliessman, 1998).

Rotations (between and within seasons)—Growing different crops in succession. Adds diversity over time. Residues of different crops added to the soil stimulate soil organism diversity and aid nutrient and disease management.

Strip cropping—Planting two or more crops in strips next to each other. Increases diversity over a larger spatial area. Strip cropping can be less management intensive than other types of intercropping because it can be designed for mechanical planting and harvesting.

Resources

Association for Temperate Agroforestry
School of Natural Resources, 203 ABNR Bldg, University of Missouri, Columbia, MO 65211 http://web.missouri.edu/~afta/

Kuepper, G. 1998. *Companion Planting: Basic Concepts and Resources*. Appropriate Technology Transfer in Rural Areas (ATTRA), Fayetteville, AR.

The Land Institute
2440 E. Waterwell Rd, Salina, KS 67401; (785) 823-5376. Offers publications on the role of diversity in the agricultural landscape.

National Agroforestry Center
USDA Forest Service and NRCS, University of Nebraska, Lincoln, NE 68583; (402) 437-5178; web: http://www.unl.edu/nac/.

Natural Resource Conservation Service (NRCS). 1996. *Agroforestry for Farms and Ranches*. Agroforestry Technical Note No. 1. USDA, NRCS, Ecological Sciences Division. http://www.nhq.nrcs.usda.gov/BCS/forest/tnote1.html

Sustainable Agriculture Network (SAN). 1998. *Managing Cover Crops Profitably*. Sustainable Agriculture Research and Education (SARE) , USDA-CSREES.

Sustainable Agriculture Network (SAN). *Diversify Crops to Boost Profits and Stewardship*. 1999. Sustainable Agriculture Research and Education (SARE) , USDA-CSREES.

UC SAREP Cover Crop Database http://www/sarep/ucdavis.edu/ccrop/.

Sources

Gliessman, S. R. 1998. *Agroecology: Ecological Processes in Sustainable Agriculture*. Sleeping Bear Press, Chelsea, MI.

Sullivan, P. 1998. *Intercropping Principles and Production Practices*. Appropriate Technology Transfer for Rural Areas (ATTRA), Fayetteville, AR.

Alternate formats available upon request. 206-205-3100 (TTY 711)

Written by Sylvia Kantor, WSU Cooperative Extension King County, 1999. Reviewed by Steve Gliessman, UCSC; David Granatstein, WSU Cooperative Extension, WWREC; Carol Miles, WSU Cooperative Extension, Lewis County.